

The First Finding of The Fig Psylla *Homotoma ficus* L. (Hemiptera, Psylloidea, Homotomidae) in Serbia

Dušanka Jerinić-Prodanović

University of Belgrade, Faculty of Agriculture, Nemanjina 6, 11080 Belgrade, Serbia
(dusanka@agrif.bg.ac.rs)

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SUMMARY

The fig psylla *Homotoma ficus* (Homotomidae, Psylloidea) is reported for the first time from Serbia where it has recently been found in 12 localities. It is a Mediterranean species which has been introduced together with cultivated fig plants also outside their original distributional range. It can cause economic damage on its host in certain years. A diagnosis and illustrations of adult, larva and egg of *H. ficus* are provided and information is given on its distribution, life cycle and natural enemies in Serbia.

Keywords: *Homotoma ficus*; *Ficus carica*; Alien species; New records; Biology; Natural enemies

INTRODUCTION

Jumping plant lice (Hemiptera: Psylloidea) is a relatively small group of phytophagous sap-sucking insects with usually narrow host ranges. It is currently classified into six families (Burckhardt, 2005). One of the smaller families is the Homotomidae which includes about 80 species worldwide, all of them associated with the plant family Moraceae and mainly the genus *Ficus* (Hollis and Broomfield, 1989; Hollis 2004). A single species, *Homotoma ficus* (Linnaeus, 1758) feeding on fig (*Ficus carica*) is present in warm regions of western Palaearctic (Burckhardt, 2011; Klimaszewski, 1973).

According to earlier investigations in regions of fig cultivation on larger parcels, *H. ficus* appears periodically in larger number when larval feeding can lead to

some damage on fig leaves, but mostly the species is not considered as an economically significant pest (Burckhardt, 1994). Economic damage has however recently been reported by Gencer et al. (2007). It is due to direct effects of larval and adult feeding on leaves, and sometimes on fruits as well, and development of sooty mold as a consequence of honeydew excretion by larvae and adults. The sooty mold inhibits respiration and photosynthesis of infested plants and also reduces the market value of infested fig fruits.

The fig psylla *H. ficus* was registered for the first time in Serbia in Belgrade (Voždovac) in 2007, after that it was found also in other localities in the country. This paper reviews the diagnostic morphological features of adults, larvae and eggs, and the information on the biology and distribution of *H. ficus* in Serbia.

MATERIAL AND METHODS

The material was being collected from 2007 to 2009 in altogether 21 localities in Serbia (Figure 1) (ten of them were from Belgrade), using visual inspection of *Ficus carica* L. The adults were collected from the host plants with an aspirator, the larvae of different instars and eggs were collected together with the plant organs on which they

were found. The material was fixed in 70% ethanol for further analysis. In order to make the tracking of first instars hatching easier, branches on which eggs were laid, were collected during February and March and put into Petri dishes in laboratory conditions at room temperature. Fifth-instar larvae were reared in Petri dishes until they became adults. The reared adults and fifth-instar larvae were fixed in 70% ethanol and used for slide making.

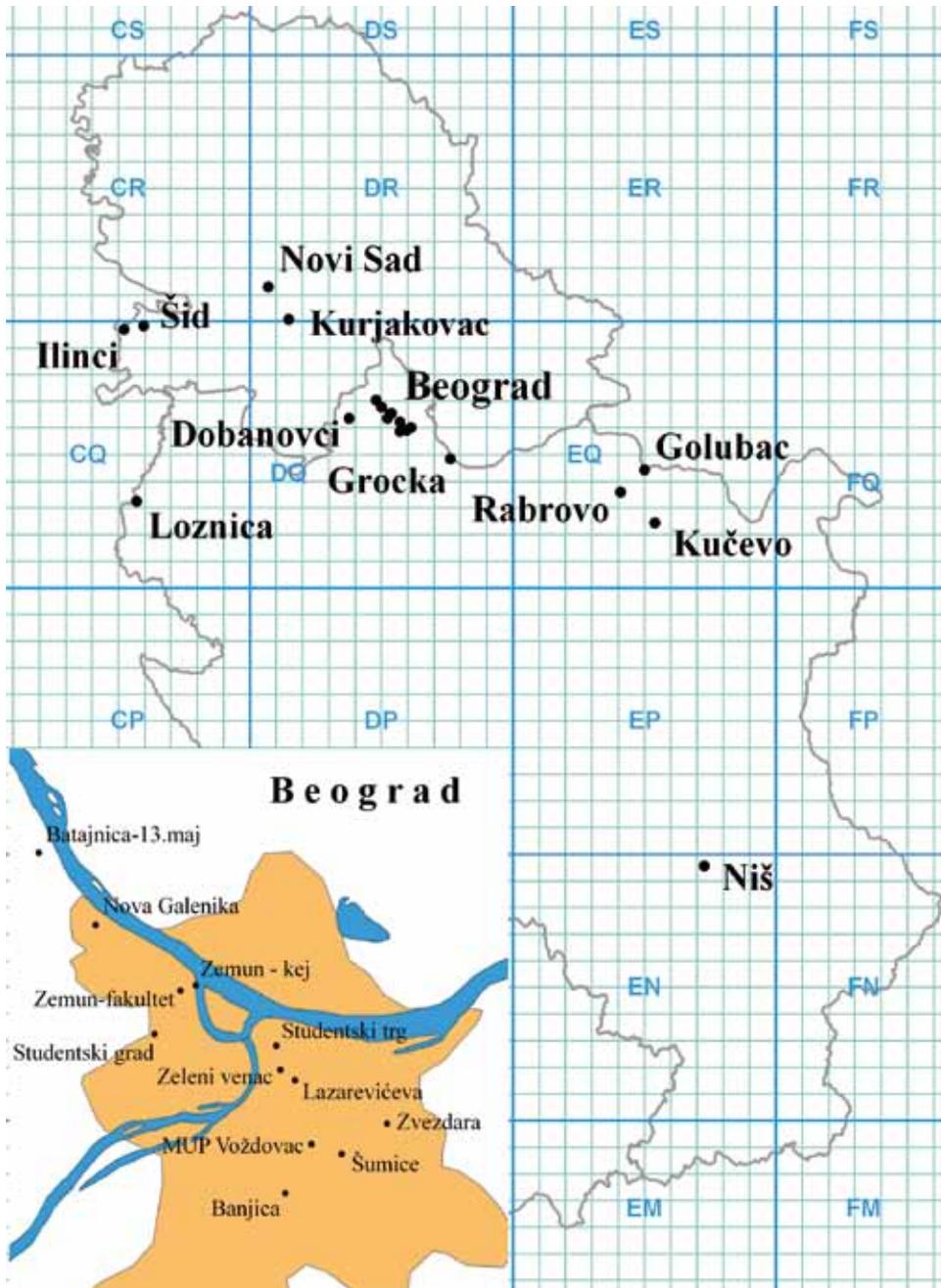


Figure 1. Map of inspected localities in UTM projection (original)

For microscopic observation and drawings, eggs were cleared in lactic acid, and then transferred in Kieffer medium using a modified method according to Kieffer (Amarine and Manson, 1996). Fifth-instar larvae and adults were macerated in 10% KOH and permanently mounted in Canada balsam (Hodkinson and White 1979). Biology of *H. ficus* was investigated in field conditions.

RESULTS

Homotoma ficus (Linnaeus, 1758)

Diagnosis

Adult. Body light green in freshly moulted specimens, later becoming darker, light green-brown (Figure 2) to yellow-brown with dark brown abdominal tergites (Figure 3). Antennae densely covered with long setae, light brown, segments 9-10 dark brown (Figure 4b). Forewing apically angular; membrane transparent; veins bearing numerous conspicuous setae, light brown with dark brown spots on apices of veins M_{1+2} , M_{3+4} , Cu_{1a} and Cu_{1b} , and two spots on anal vein. Male terminalia with proctiger bipartite and paramere relatively narrow and parallel-sided, apically slightly turned posteriad (Figure 4d). Female terminalia relatively long, proctiger and subgenital plate apically subacute (Figure 4e).



Figure 2. Adult female of *Homotoma ficus* L. (original)



Figure 3. Adult male of *Homotoma ficus* L. (original)

Adult measurements (in mm). Male: body length (BL): 3.25 to 3.55; head width (HW): 0.73-0.75; antenna (AL): 1.62-1.67; fore wing length (WL): 3.86-3.90; fore wing width (WW): 1.38-1.42; metatibia length (TL): 0.82-0.81; male proctiger length: 0.40-0.41; paramere length (PL): 0.29-0.37; distal segment of aedeagus length (DL): 0.32-0.39. Female (BL): 3.50-3.80; HW: 0.77-0.82; AL: 1.55-1.60; WL: 3.52-3.76; WW:

1.51-1.66; TL: 0.83-0.84; female proctiger length (FP): 0.92-0.95; female subgenital plate length (SL): 0.72-0.78.

Larva. First instar with yellow body, bright red eyes and dark brown legs. Fifth-instar bright green with whitish wing pads (Figure 6); dorsum and body margin densely covered with simple setae (Figure 4f), tarsal arolium and circumanal pore ring as in Figures 4i and 4h.

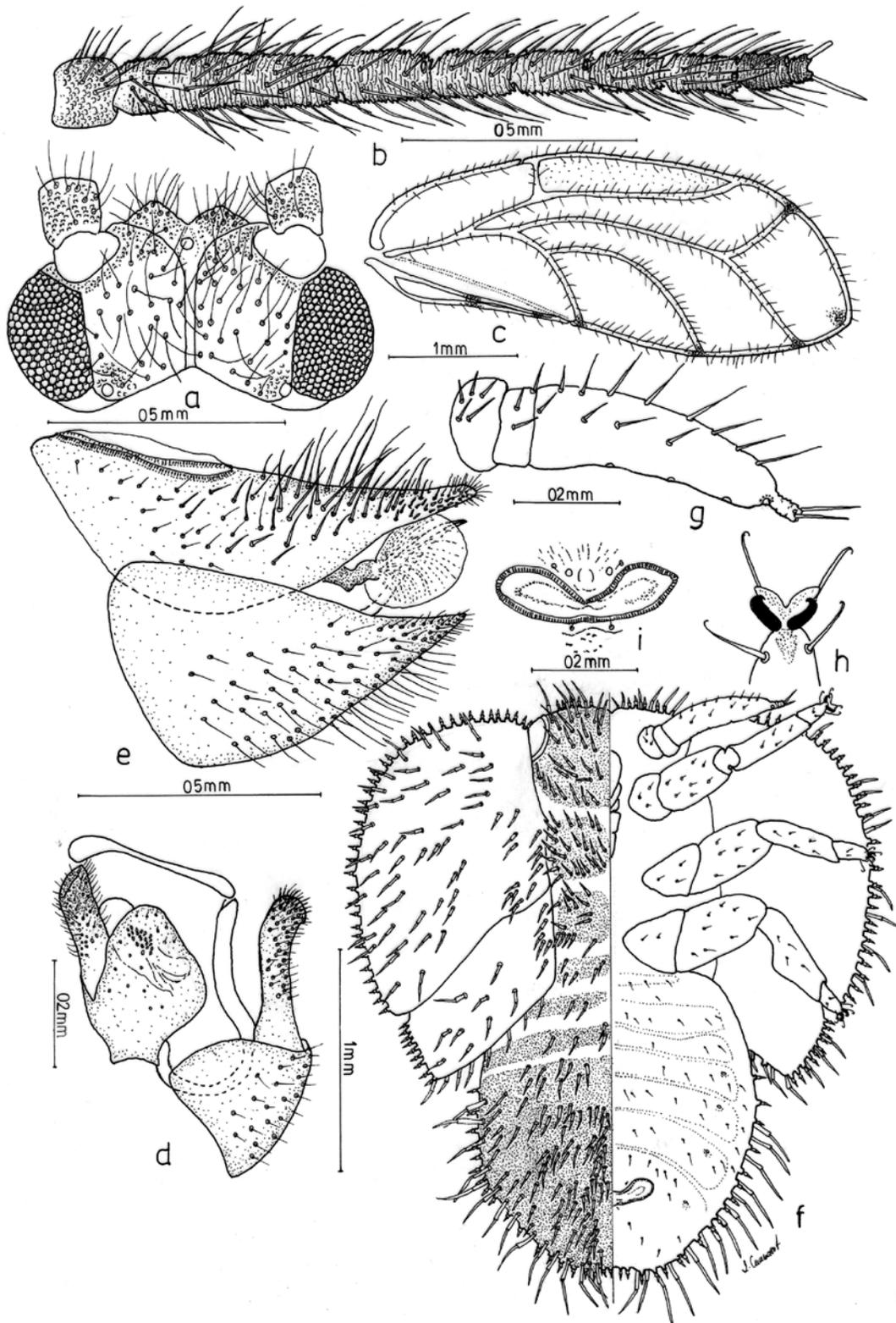


Figure 4. *Homotoma ficus* L., adult: a-head (dorsal view), b-antenna, c-forewing, d-male terminalia (lateral view), e-female terminalia (lateral view); fifth instar larva: f-general view (left dorsal, right ventral surface), g-antenna, h-apex of tibiotsarsus, i-circumanal pore ring (original)



Figure 5. Egg of *Homotoma ficus* L. (original)

Fifth instar larva measurements (in mm). Body length (BL): 2.48-2.51; body width (BW): 2.28-2.44; antenna length (AL): 0.69-0.70; fore wing pad length (FL): 1.22-1.96; metatibiotarsus length: 0.57-0.58; caudal plate length (CL): 0.69-0.78; caudal plate width (CW): 1.09-1.22; circumanal ring width (RW): 0.32-0.35.

Egg. Oval in shape, with pedicel situated ventrally and long terminal filament (Figure 5). Recently laid eggs light yellow, later becoming bright yellow.

Adults and immature stages of *H. ficus* were also described and illustrated by Dobreanu and Manolache (1962), Tamanini (1965), Nguyen and Dargagnon (1978), Hodkinson and White (1979) and Rapisarda (1989).

Distribution

From 2007 to 2009, jumping plant lice were registered in 12 out of 21 examined localities in Serbia, out of which 10 were in Belgrade. Apart from this region, figspsylla was registered in Dobanovci and Novi Sad (Figure 1) as well.

Localities. Dobanovci (DQ3789263688, 80 m) (May 11, 2008 (L₃), Novi Sad – Liman (DR1009911412, 80 m) (June 9, 2008 (L₅, 4♀, 1♂), October 2, 2008, (eggs, 1♀), May 15, 2009 (L₃)). Belgrade region: Voždovac (DQ5842859541, 85 m) (April 25, 2007 (L₃), May 3, 2007 (L₄, L₅), May 26, 2007 (L₅, 12♀, 9♂), February 27, 2008 (eggs), March 14, 2008 (eggs), October 21, 2008 (eggs, 5♀, 1♂)), Šumice (DQ5958159159, 85 m) (May 24, 2007 (L₃)), Zemunski kej (DQ5437563864, 77 m) (May 10, 2007 (L₃), May 16, 2007 (L₄, L₅), June 21, 2007 (L₅), July 18, 2007 (3♀, 3♂), September 20, 2007 (5♀, 3♂, eggs), October 8, 2007 (eggs), March 26, 2008 (eggs, L₁), April 7, 2008 (eggs, L₁), May 15, 2008 (L₃), May 30, 2008, October 19, 2008 (eggs, 3♀, 3♂), May 18, 2009 (L₃, L₄), June 25, 2009 (L₅, 4♀, 3♂)), Nova Galenika (DQ5021567776, 90 m) (May 9, 2007 (L₃)), Lazareviceva street (DQ5779861931, 125 m) (May 25, 2007 (L₅)), Studentski grad (DQ5245563671, 80 m)



Figure 6. Fifth instar nymph of *Homotoma ficus* L. (original)

(May 31, 2007 (L₅)), Zeleni venac (DQ5724562323, 120) (August 15, 2007 (1♀, 1♂)), Zemun – Faculty of Agriculture (DQ5344865302, 75) (September 17, 2007 (2♀, 1♂, eggs), June 26, 2008 (L₅), September 1, 2008 (eggs, 3♀), May 6, 2009 (L₃)), Zvezdara (DQ6130760301, 214 m) (April 13, 2008 (L₁, L₂)) and Banjica (DQ5749657607, 190) (September 10, 2008 (15♀, 12♂, eggs), September 23, 2008 (10♀, 8♂, eggs), April 8, 2009 (eggs, L₁), May 21, 2009 (L₄, L₅)).



Figure 7. Larvae of *Homotoma ficus* on lower side of leaf *Ficus carica* (original)

H. ficus was not found in: Ilinci (CQ5220797046, 82 m) (May 1, 2007, March 2, 2008 and March 15, 2008), Šid (CQ5971798424, 104 m) (May 25, 2007, August 19, 2007 and August 19, 2008), Rabrovo (EQ4090836016, 140 m) (May 25, 2007), Kučevo (EQ5408224440, 160 m) (May 25, 2007), Batajnica (DQ4805370488, 100 m) (March 11, 2008), Niš (EN7277895623, 200 m) (April 20, 2008), Grocka (DQ7628048484, 125 m) (May 10, 2008), Golubac (EQ5001644363, 80 m) (May 10, 2008), Fruška Gora – Kurjakovac (DR1485201110, 327 m) (October 2, 2008).

Biology

The fig psylla has one generation per year. It overwinters in the egg stage on the host plant. In laboratory conditions, larvae of *H. ficus* started hatching on March 17, 2008. In field conditions, hatching was registered on March 26. Larvae of the first and second instar are hidden under flaked bud leaves. From the third instar on, larvae are concentrated on both sides of leaf veins on the lower side of the leaf (Figure 7). The presence of third-instar larvae was registered on April 25. The number of larvae per leaf was between 2 and 20. While feeding, larvae excrete honeydew which is usually wrapped in wax, so their presence can be recognized by wax secretion in the form of drops or threads on leaves. The first eclosion of adults was registered at the end of May (May 26, 2007 and May 30, 2008). During summer (June to August), adults were found on fig mostly on lower sides of the leaves, concentrated near major leaf veins. Copulation was observed at the end of August and during September, first laid eggs were registered in September (September 17, 2007 and September 1, 2008). Eggs were laid near leaf buds and in the folds of the bark in small groups.

Natural enemies

During investigations of the biology of the fig psylla, the presence of two species of predatory bugs was registered. *Malacocoris chlorizans* Panzer (Heteroptera: Miridae) was found in all localities where the fig psylla was present and was observed to feed on larvae of *H. ficus*. Furthermore, *Orius minutus* (L.) (Heteroptera: Anthicoridae) was registered as an egg predator of *H. ficus*.

DISCUSSION

According to literature, fig psylla *Homotoma ficus* has one generation per year and overwinters in the egg stage on host plant (Boselli, 1929; Dobreanu

and Manolache, 1962; Loginova, 1968; Burckhardt, 1994; Gencer et al., 2007). During our investigations, we confirmed that fig psylla *H. ficus* has one generation per year and that it overwinters in the egg stage on host plant, which coincides with previously mentioned authors.

For the region of the Crimea, Loginova, 1968, found that larvae start hatching at the beginning of April, and she registered the first eclosion of adults in mid-June, while in coastal part of Georgia she noted that the development of *H. ficus* was about two weeks later. Dobreanu and Manolache, 1962, cite that in the region of France (Montpellier) larvae hatch during February and March. Gencer et al. (2007) cite that in the region of Turkey larvae hatch at the beginning of April and the eclosion of adults is in May.

Similar data were obtained during these investigations. The beginning of larvae hatching in our conditions is at the end of March or beginning of April. First-instars and second-instars are hidden under flaked bud leaves. From the third stage of development larvae concentrate on lower side of a leaf, on both sides of leaf nerves. First eclosed adults are registered at the end of May and beginning of June.

Loginova, 1968, found that in the region of the Crimea, adults stay on fig usually 7-10 days after eclosion, and then move to other plants, such as conifers, oak, horse-chestnut, hawthorn and date. Loginova registered the return to the host plant in September when she also registered first laid eggs. However, Gencer et al., 2007, cites that adults are on fig from May until the end of September in the region of Turkey, and that they lay eggs in October.

In our investigations during summer months, adults of *H. ficus* could be found on fig, mostly on sunny parts of the crown (south and south-west exposition) and mostly on lower part of the leaf. At the end of August and beginning of September, adults could be found copulating, and first laid eggs were registered at the beginning of September.

H. ficus is originally distributed in the Mediterranean area and the Middle East. However, it has been introduced together with the host plant in other countries outside the original distributional range, too. Hodkinson and White (1979) register it from the Great Britain. Burckhardt and Mühlethaler (2003) report it from Switzerland. According to Mijušković, 1999, and Seljak, 2006, *H. ficus* is also present in coastal regions of Slovenia, Croatia and Montenegro. Halperin et al., 1982, and Gencer et al., 2007, registered fig psylla in the USA (California), too.

During these investigations, *H. ficus* was registered in the region of Belgrade and Novi Sad, for the first time in Serbia. According to the fact that *H. ficus* overwinters on host plant in the stage of egg, its presence can be expected in other localities in Serbia aside from the ones registered by now.

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REFERENCES

- Amrine, Jr, J.W. and Manson, D.C.M.*: Preparation, mounting and descriptive study of Eriophyoid mites. In: Eriophyoid Mites – Their Biology, Natural Enemies and Control (Lindquist E.E., Sabelis M.W. Bruin J., eds.), Elsevier Science B. V., 1996, pp. 383-396.
- Boselli, F.B.*: Studi sui Psillidi. I. Contributo alla conoscenza della Psylla del fico (*Homotoma ficus* L.). Bollettino del Laboratorio di Entomologia Agraria Filippo Silvestri, Portici, 21: 218-251, 1929.
- Burckhardt, D.*: Psyllid pest of temperate and subtropical crop and ornamental plants (Homoptera, Psylloidea). A review. Entomology (Trends in Agricultural Sciences), 2: 173-186, 1994.
- Burckhardt, D.*: Biology, ecology, and evolution of gall-inducing psyllids (Homoptera: Psylloidea). In: Biology, Ecology and Evolution of Gall-inducing Arthropods (Raman A., Schaefer C.W. and Withers T.M., eds.), Science Publishers, Enfield – Plymouth, 2005, pp. 143-157.
- Burckhardt, D.*: Fauna Europaea: Psylloidea. Fauna Europaea version 2.4, <http://www.faunaeur.org>, 2011.
- Burckhardt, D. and Mühlethaler, R.*: Exotische Elemente der Schweizer Blattflohfauna (Homoptera, Psylloidea) mit einer Liste weiterer potentieller Arten. Mitteilungen der Entomologischen Gesellschaft Basel, 53: 98-110, 2003.
- Dobreanu, E. and Manolache, C.*: Insecta. Homoptera, Psylloidea. Fauna Republicii Populare Romine. Academia Republicii Populare Romine, Vol. 8 (3), 1962.
- Gencer, N.S., Coskuncu, K.S. and Kumral N.A.*: The colonization preference and population trends of larval fig psylla, *Homotoma ficus* L. (Homiptera: Homotomidae). Journal of Pest Science, 80(1): 1-8, 2007.
- Halperin, J., Hodkinson, I.D., Russell, L.M. and Berlinger, M.J.*: A contribution to the knowledge of the psyllids of Israel (Homoptera: Psylloidea). Israel Journal of Entomology, XVI: 27-44, 1982.
- Hodkinson, I.D. and White I.M.*: Homoptera, Psylloidea. Handbooks for the Identification of British Insects, Royal Entomology Society of London, Vol. II, Part. 5(a), 1979, pp. 60-77.
- Hollis, D.*: Australian Psylloidea: jumping plantlice and lerp insects. Australian Biological Resources Study, Canberra, 2004, 216 pp + 11 pl.
- Hollis, D. and Broomfield, P.S.*: *Ficus*-feeding psyllids (Homoptera), with special reference to the Homotomidae. Bulletin of the British Museum (Natural History) (Entomology), 58: 131-183, 1989.
- Klimaszewski, S.M.*: The Jumping Plant Lice or Psyllids (Homoptera, Psylloidea) of the Palaearctic. An annotated Check-List, Annales Zoologici, Warszawa, Tom XXX, Nr. 7, Polska Akademia Nauk. Inst. Zool., 1973, pp. 155-286.
- Лозникова, М.М.*: Новые данные по фауне и биологии псиллид (Homoptera, Psylloidea) Кавказа. Насекомые Кавказа. Труды всесоюзного Энтомологического общества Академия наук, Ленинград, Том 52, 1968, стр. 275-328.
- Mijušković, M.*: Bolesti i štetočine suptropskih voćaka. Univerzitet Crne Gore, Biotehnički Institut, Podgorica, 1999.
- Nguyen, T.X. et Dargagnon, D.*: Contribution a la connaissance des psyllides de France 2.-Description des adultes de *Homotoma ficus* (Homoptera-Psylloidea-Carsidaridae). Bulletin de la Société d'histoire naturelle (Toulouse), Tom 114: 42-50, 1978.
- Seljak, G.*: An overview of the current knowledge of jumping plant-lice of Slovenia (Homiptera: Psylloidea). Acta entomologica Slovenica, 14(1) :11-34, 2006.
- Rapisarda, C.*: Presenza in Sicilia della psylla verde del fico (*Homotoma viridis* Klimaszewski) e descrizione della sua nimfa di ultima età. Bollettino della Societa Entomologica Italiana, 121(1): 13-18, 1989.
- Tamanini, L.*: Osservazioni sulla distribuzione e sui caratteri specifici delle psille del fico (Homoptera, Psylloidea). Atti della Accademia Roveretana degli Agiati :B:i Scienze Fisiche, Matematiche e Naturali, ser. 6, 5 (b), 105-110, 1965.

Prvi nalaz lisne buve *Homotoma ficus* L. (Hemiptera, Psylloidea, Homotomidae) u Srbiji

REZIME

Tokom istraživanja faune lisnih buva Srbije na više lokaliteta je po prvi put registrovana smokvina lisna buva *Homotoma ficus* (Homotomidae, Psylloidea). To je mediteranska vrsta koja je introdukovana zajedno sa smokvom i u druge regione. Ponekad može da dovede do značajnijih ekonomskih šteta u regionima gajenja smokve.

U radu je dat opis vrste, biologija, rasprostranjenost u Srbiji, kao i registrovani predatori.

Ključne reči: *Homotoma ficus*; *Ficus carica*; invazivna vrsta; nov nalaz; biologija; prirodni neprijatelji